

### **CLASSWORK:**

1. According to Census Bureau data, in 1998 the California population consisted of 50.7% whites, 6.6% blacks, 30.6% Hispanics, 10.8% Asians, and 1.3% other ethnic groups. Suppose that a random sample of 1000 students graduation from California colleges and universities in 1998 resulted in the following data on ethnic groups: 679 white, 51 black, 77 hispanic, 190 asian, 3 other. Do these data provide evidence that the distribution of ethnic groups of graduating college students differs from the distribution of ethnic groups of the state? Test the hypotheses using  $\alpha = 0.01$ .

Check:

- |                             |                                   |
|-----------------------------|-----------------------------------|
| 1) SRS                      | 1) stated                         |
| 2) Categorical data         | 2) races are categorical          |
| 3) all exp. values $\geq 5$ | 3) all are $\geq 5$<br><i>exp</i> |

Conditions met  $\Rightarrow$  Chi-Square distribution  $\Rightarrow$   
Chi-Square GOF test

Ho: The distribution of student graduates fits the  
California population

Ha: The distribution of student graduates doesn't fit the  
California population

$$X^2 = \sum \frac{(\text{obs} - \text{exp})^2}{\text{exp}} = \frac{(679 - 507)^2}{507} + \frac{(51 - 66)^2}{66} + \dots = 303.09$$

$$P(X^2 > 303.09 | \text{df} = 4) = 2.338 \times 10^{-64}$$

We reject  $H_0$  b/c p-value of  $2.338 \times 10^{-64}$  is  $< \alpha = 0.01$ .

We have sufficient evidence that the distribution of student graduates doesn't fit the California population.

2) A researcher wishes to know whether there is a relationship between political philosophy and preferred news program among residents of a particular city who regularly watch the national news. A random sample of 300 regular watchers is selected.

Politics	Network News			
	ABC	CBS	NBC	PBS
Liberal	20	20	25	15
Moderate	45	35	50	20
Conservative	15	40	10	5

Check:

- |                             |                       |
|-----------------------------|-----------------------|
| 1) SRS                      | 1) stated             |
| 2) Categorical data         | 2) chart              |
| 3) all exp. values $\geq 5$ | 3) all are $\geq 5$ ✓ |

Conditions met  $\Rightarrow$  Chi-Square distribution  $\Rightarrow$   
Chi-Square test for Independence

$H_0$ : Political party and news station are independent

$H_a$ : Political party and news station are dependent

$$X^2 = \sum \frac{(\text{obs} - \text{exp})^2}{\text{exp}} = \frac{(20 - 21.333)^2}{21.333} + \frac{(20 - 25.333)^2}{25.333} + \dots$$
$$= 30.399$$

$$P(X^2 > 30.399 | \text{df} = 6) = 3.2999 \times 10^{-5}$$

We reject  $H_0$  b/c p-value of  $3.2999 \times 10^{-5}$  is  $< \alpha = 0.05$ .

We have sufficient evidence that political party and news station are dependent.